

Digital storytelling as a framework for inquiry-based museum learning

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Abstract—This paper presents preliminary findings of a study of mobile-supported digital storytelling as a frame for inquiry-based museum learning. The first in a series of trials is presented, which involved 26 13-14 years old students of an international school in Thessaloniki, Greece, and comprised intervention lessons as part of the Art History curriculum and a trip to an ethnographic museum. The students worked in groups to devise questions about the exhibits that were meaningful to them and used smartphones and tablets to find answers during the visit and craft digital stories to present the results of their inquiries. The qualitative findings indicate high levels of engagement and task efficacy, whereas the quantitative findings indicate no significant changes in research skills development. The paper concludes with the interpretation of the findings and recommendations for future research.

Keywords—mobile-supported digital storytelling; inquiry-based learning; museums; school visits

I. INTRODUCTION

This paper presents preliminary findings of a study of mobile-supported digital storytelling as a frame for inquiry-based museum learning. The study examines how and to what extent the process of crafting a digital story contributes to research skills development and if it facilitates inquiry-based learning on museum school trips.

The paper is structured as follows. Section II presents a brief review of the literature that informed the development of the conceptual framework. Section III presents the settings, the sample population and the design, and explains the rationale behind the data collection methods. Section IV presents the preliminary findings and section V discusses the contribution of the trial and draws conclusions.

II. LITERATURE REVIEW

Growing evidence from studies reviewed in [13] shows that mobile digital technologies augment the ways students engage in personally relevant investigations and make the most of the learning experience. Digital storytelling in the classroom provides ample opportunities for meaningful participation that leads to cognitive gains such as skills development and knowledge generation [1] [7] [11]. Commensurate with constructivist pedagogies [2] [5], mobile digital technologies in the museum facilitate self-directed explorations [3] [4] [6] [8] and enliven the learning experience by interaction with the exhibits [10]. Participation and engagement can be structured around visitor-constructed stories as museums are ideal environments for self-initiated explorations framed by narrative [12]. Efforts to leverage

mobile-supported digital storytelling, in order to structure school visits, extend the role of the museum as a storyteller [9] and offer new possibilities to give voice to the visitor and better understand the learning experience.

III. RESEARCH METHODOLOGY

A. Settings and sample population

The intervention lessons took place in October-November 2016 in an international school in Thessaloniki, Greece. The school was chosen because its curriculum is built around inquiry and student-run activities using advanced learning technologies. This meant that we could build the digital storytelling framework on the school's solid inquiry and technology-enhanced learning foundations, eliminating these as variables in our analysis. The ethnographic museum of Macedonia-Thrace in Thessaloniki was chosen because of its interdisciplinary and hands-on learning approach, its provision for the use of mobile devices onsite and, most importantly, its fit with the Art History curriculum.

A class of 26 13-14 years old students (11 girls and 15 boys) took part in the trial, as part of their Art History course. The class was chosen because students had prior experience of art-led inquiry-based activities and they could bring and use their own mobile devices in the classroom. All students and their guardians agreed to take part in the study and signed informed voluntary consent forms.

B. The Digital Storytelling intervention

The intervention included two pre-visit lessons that took place in the classroom, a two-hour museum visit and one post-visit lesson back in the classroom. In the first lesson, the students were introduced to the exhibition content and were asked to work in groups of three to develop inquiry questions that were meaningful to them, and which required further investigation within the museum to be answered. In the second lesson, the digital storytelling process was explained and two mobile apps were recommended for use in crafting digital stories. Splice and ComPhone apps were chosen, based on a review of related literature [1]. The students decided for themselves which app to use and they planned their investigations using storyboards [7]. In the museum, the students used their smartphones and tablets to search for and collect information about the exhibits that related to their inquiry questions, as well as to create story materials such as text for the scripts, photographs and videos. In the final lesson, the students organized and put to-

gether their story materials in the form of videos to present the results of their group inquiries.

A combination of qualitative and quantitative methods was used for data collection, including: a) Pre- and post-intervention Likert scale questionnaires with a series of statements that aimed to get student perceptions of their research skills and compare how these perceptions changed following the intervention (the former was administered before the first lesson and the latter was administered after the fourth lesson). b) Structured observation and photographic documentation of the students' performance and behavioral patterns in the museum. c) Reflective field notes taken immediately after each lesson, to document researcher perceptions of how the digital storytelling process maps onto the inquiry-based learning process. d) A focus group discussion with students to examine their level of engagement and enjoyment of the tasks, their group work and the overall learning experience. e) The collection of all student-generated outputs (storyboards, story materials and digital stories) as evidence of task efficacy and cognitive gains.

IV. PRELIMINARY FINDINGS

A. Task performance

The qualitative data indicate high levels of engagement with the activities and the exhibits. This was anticipated because the investigations were driven by questions chosen by the students themselves, driven by their interests and curiosity. For instance, one group decided to research the fulling tub's function and purpose, which was a water-powered mechanism for washing and making woollen clothes durable and waterproof. The mechanism consists of a wooden inverted cone built into the ground with iron hoops to prevent the water's pressure from breaking it apart. The students asked "What was the object used for and what can it tell us about the society in which it was made?" and "How has its use changed over time?" (October 2016, Field notes). Data from the observation forms corroborate the findings from the field notes and photographs about engagement.

The observation data indicate that most students were able to locate resources in the museum relevant to their inquiries, and that they were keen both to gather information through picture taking and to generate story materials by writing and recording their scripts (Figure 1). The amount and quality of story materials generated by groups suggests that differences found between some groups' storyboards and the respective final stories, are more likely to be due to changes in story plans or to technical difficulties in putting the materials together, rather than inability to find or generate supporting information.

The photographic data indicate that groups had relatively uniform experiences in terms of interactions with the exhibits and amongst group members. The analysis indicates that they engagement with exhibits was hands-on, they read the exhibit labels and interpretive panels, and used the mobile devices effectively. Figure 2 depicts a group of students collaborating to video-record an exhibit in action. The focus group discussion revealed overall satisfaction with the use of

smartphones and tablets – which was anticipated, because students were using their own devices – and no issues were reported regarding the use of the two apps. However, although all the groups finished their stories on time, many of the students said that they would have liked more time to edit and "polish" the videos.

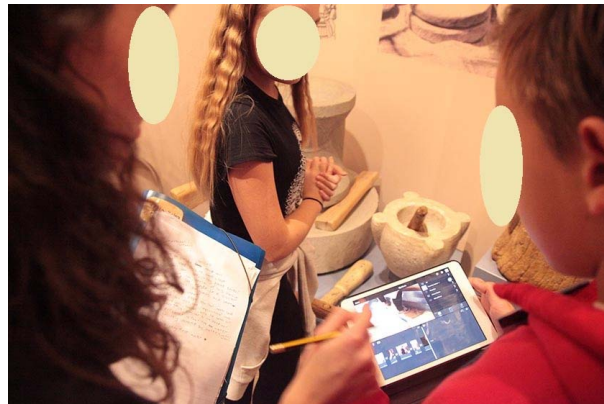


Figure 1. Students in the museum, reviewing their story materials.

With respect to interactions within student groups during the museum visit, the data show that the students continuously negotiated roles within their groups, demonstrated good communication skills, and established rapport. The latter was made possible by the fact that they worked in the same groups throughout the intervention, which gave them time to build group cohesion before the museum visit. A thorough analysis of the student-generated outputs is pending; preliminary analysis suggests this will confirm that the students were able to answer their inquiry questions through digital storytelling.

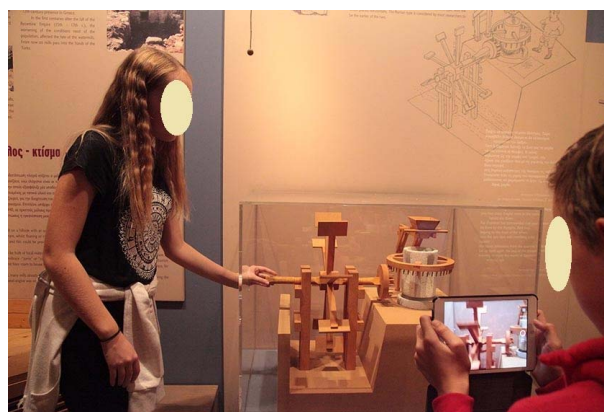


Figure 2. Students video-recording story materials in the museum.

B. Student perceptions of research skills

A preliminary analysis of the questionnaires indicates no significant changes in students' perceptions of their research skills. The questionnaires sought self-assessment using a five-point Likert scale. A comparison of medians of responses in pre- and post-tests shows only minor differences, while Wilcoxon tests show no statistical

significance, indicating that students' perceptions of their abilities did not change with the intervention. Two exceptions were observational and risk-taking skills. Wilcoxon tests showed that the students self-perceptions were statistically significantly higher in the post-test both about their observational skills ($W(13) = 13, p < .05$, two-tailed test) and their skills in taking calculated risks ($W(17) = 30, p < .05$, two-tailed test). These improvements can be explained by the fact that the students had to plan in advance their investigations using storyboards, thereby preparing their observations and canvassing areas for experimentation.

The majority of the students stated in the post-visit questionnaire that filming and narrating – i.e. explaining in their scripts what the artifacts were and how they worked – were the most useful activities because they could “explain what is being shown” (November 2016, Questionnaire); whereas taking photographs was not very helpful because “photographs do not show how the object works unless it is written down” (November 2016, Questionnaire). This is of great interest because it seems to problematise the value placed on visual information alone by the dominating photographing practices of museum visitors.

Similarly, relevant data from the photographs show that the students engaged in investigation practices such as close looking, reading labels, taking notes, touching the exhibits, writing and re-writing their scripts. For instance, one student said “I think observing the objects was the most useful part for our investigation” (November 2016, Questionnaire). Further analysis of changes in self-perceptions of research skills per student is underway to determine the impact that digital storytelling had in this area.

V. DISCUSSION AND CONCLUSION

The trial presented here is the first on a series of trials that aim to examine the value of Digital Storytelling for framing learning inquiries during school museum visits. In doing so, the project proposes a new way in which museums can approach school groups, by engaging students in personally relevant investigations. Interventions like this can thus forge synergistic links between the school and the museum and are therefore welcome by teachers and museum educators alike.

The objectives of this first trial were to test the intervention lesson plans and the data collection procedures; as well as to generate the first set of data for the project. The preliminary findings presented here are encouraging, suggesting that digital storytelling can effectively frame museum inquiries. However, our findings have limited generalisability as they are based on a single trial and therefore data collection and analysis have been context-dependent in terms of student age group, course subject and museum setting. In addition, the BYOD (bring your own device) approach adopted in this trial may not be possible in other school contexts, resulting in the introduction of unfamiliar devices and apps which might disrupt the student experience. A second trial is currently designed to refine the intervention and to test the impact of these factors, with a final trial planned as a between-groups design that will

compare museum inquiries framed by digital storytelling with inquiries without a digital storytelling framing.

ACKNOWLEDGMENT

We are very grateful to the participating students, school and museum staff. The trial was funded by the University of Leicester's College of Social Sciences, Arts and Humanities PGR Fund.

REFERENCES

- [1] B. Robin, “The educational uses of digital storytelling,” *Proc Society for Information Technology and Teacher Education International Conference*, C. Crawford et al., Eds. Virginia: AACE, 2006.
- [2] E. Hooper-Greenhill, *The Educational Role of the Museum*, New York: Routledge, 1999.
- [3] E. Peltekova, D. Miteva, E. Stefanova, and K. Stefanov, “Mobile Technologies Supporting Research Approach in Teaching and Learning: weSPOT inquiry-based study,” *Proc International Conference on Interactive Mobile Communication Technologies and Learning*, pp. 198-202, 2014.
- [4] E. Scanlon, S. Anastopoulou, L. Kerawalla, and P. Mulholland, “How technology resources can be used to represent personal inquiry and support students' understanding of it across contexts,” *Journal of Computer Assisted Learning*, vol. 27, pp. 516-529, 2011.
- [5] G. Hein, “The Constructivist Museum,” *Journal of Education in Museums*, vol. 15, pp. 1-10, 1998.
- [6] G. Vavoula, M. Sharples, P. Rudman, P. Lonsdale, and J. Meek, “Learning Bridges: a role for mobile technologies in education,” *Educational Technology*, vol. XLVII, n. 3, pp. 33-37, 2007.
- [7] J. B. Ohler, *Digital Storytelling in the Classroom: New Media Pathways to Literacy, Learning, and Creativity*, California: Corwin Press, 2013.
- [8] J. McLeod, and K. M. Kilpatrick, “Exploring science at the museum,” *Educational Leadership*, vol. 58, n. 7, pp. 59-63, 2001.
- [9] L. Bedford, “Storytelling: The real work of museums,” *Curator: The Museum Journal*, vol. 44, n. 1, pp. 27-34, 2001.
- [10] R. Hawkey, “Digital Technologies and Museum Learning,” in *The Responsive Museum: Working with Audiences in the Twenty-First Century*, C. Lang, J. Reeve, and V. Woollard, Eds. Oxon: Ashgate Publishing Group, pp. 115-116, 2006.
- [11] S. Nordmark, and M. Milrad, “Mobile Digital Storytelling for Promoting Creative Collaborative Learning,” *Proc IEEE 7th International Conference on Wireless, Mobile and Ubiquitous Technology in Education*, pp. 9-16, 2012.
- [12] V. Lombardo, and R. Damiano, “Storytelling on mobile devices for cultural heritage,” *New Review of Hypermedia and Multimedia*, vol. 18, n. 1-2, pp. 11-35, 2012.
- [13] Z. Tsiviltidou, “Digital storytelling with mobile media for inquiry-based museum learning,” *Proc IEEE 9th International Conference on Interactive Mobile Communication Technologies and Learning*, pp. 91-95, 2015.